

POWER SYSTEM OPERATING INCIDENT REPORT – MULTI-ELEMENT TRIP AT BRAEMAR ON 18 OCTOBER 2012

PREPARED BY: System Performance & Commercial

DATE: 27 December 2012

FINAL

Disclaimer

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Abbreviations

Abbreviation	Term
CB	Circuit Breaker
DI	Dispatch Interval
EMS	Energy Management System
kV	Kilovolt
MW	Megawatt
NEM	National Electricity Market

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Incident summary

Date and time of incident	18 October 2012 at 2004hrs.
Region of incident	Queensland.
Affected regions	Queensland.
Event type	TT – Loss of multiple transmission elements.
Primary cause	TE – Transmission Equipment Failure.
Impact	NIL.
Associated reports	NIL.

1 Introduction

At 2004 hrs on 18 October 2012, 9901 Braemar – Bulli Creek 330 kV transmission line and the No.1 330/275 kV transformer at Braemar tripped. The 9901 Braemar – Bulli Creek 330 kV transmission line auto-reclosed at the Bulli Creek end only.

The 9901 Braemar – Bulli Creek 330 kV transmission line was returned to service at 2019 hrs on 18 October 2012. The No.1 330/275 kV transformer at Braemar was returned to service at 1507 hrs on 19 October 2012.

This report has been prepared under clause 4.8.15 (c) of the National Electricity Rules (NER) to assess the adequacy of the provision and response of facilities and services and the appropriateness of actions taken to restore or maintain power system security.

This report is largely based upon information provided by Powerlink. Data from AEMO's Energy Management System (EMS) and Electricity Market Management System (EMMS) has also been used in analysing the incident.

All references to time in this report are to National Electricity Market time (Australian Eastern Standard Time).

2 Pre-Contingent System Conditions

The status of the power system prior to the incident is shown in Figure 1. For clarity, only equipment relevant to this incident has been included in the diagram.

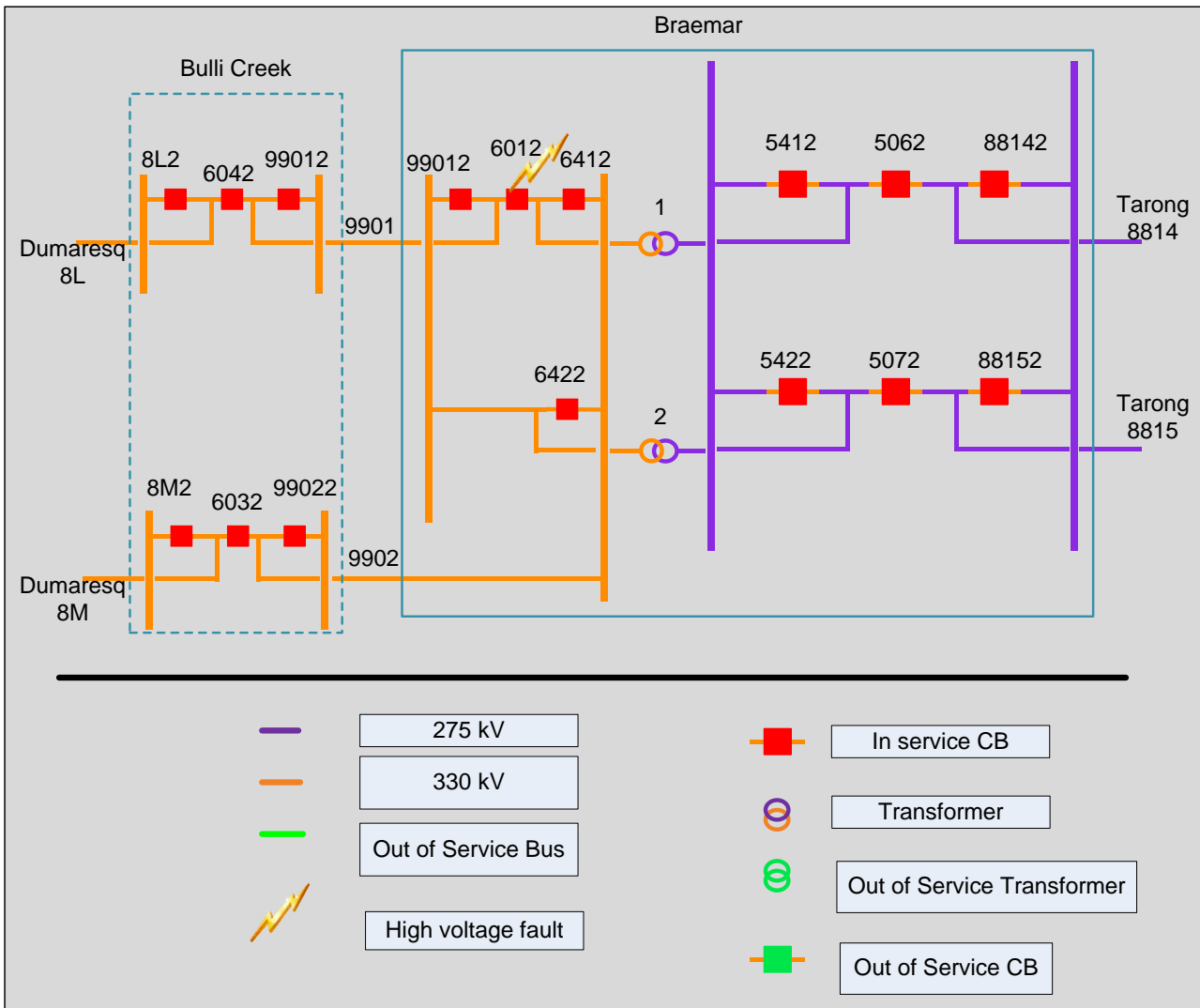


Figure 1 - Status of the power system prior to the incident.

3 Summary of Events

The following is a summary of events:

Time	Events
18/10/2012 20:04:08 hrs	No.1 330/275 kV transformer at Braemar tripped. The 9901 Braemar – Bulli Creek 330 kV transmission line tripped. Note: As designed, only A phase pole at the Bulli Creek end opened on CB 99012.
18/10/2012 20:04:10 hrs	Auto reclose operates to re-energise the A phase on the 9901 Braemar – Bulli Creek 330 kV transmission line via CB 99012 at Bulli Creek.
18/10/2012 20:14 hrs	AEMO issued Market Notice No.40047,

	<p>advising the market of the non-credible contingency event.</p> <p>AEMO applied constraint sets:</p> <ul style="list-style-type: none"> • Q-BCKBR_9901_9902 • Q-BR_TX
18/10/2012 2019 hrs	The 9901 Braemar – Bulli Creek 330 kV transmission line was returned to service.
18/10/2012 2024 hrs	<p>AEMO issued Market Notice No.40048, advising of the associated constraints invoked.</p> <p>AEMO revoked the Q-BCKBR_9901_9902 constraint set.</p>
18/10/2012 2033 hrs	AEMO issued Market Notice No.40049, advising the 9901 Braemar – Bulli Creek 330 kV transmission line had returned to service.
19/10/2012 1507 hrs	Braemar No.1 330/275 kV transformer was returned to service after 330 kV CB 6012 at Braemar was isolated.
19/10/2012 1530 hrs	AEMO revoked the Q-BR_TX constraint set
19/10/2012 1619 hrs	AEMO issued Market Notice No.40058, advising Braemar No.1 330/275 kV transformer had returned to service.
23/10/2012	Failed 330 kV hybrid unit replaced and 330 kV CB 6012 returned to service.

At 20:04:08 hrs on 18 October 2012, the 9901 Braemar – Bulli Creek 330 kV transmission line and the No.1 330/275 kV transformer at Braemar tripped due to a high voltage fault internal to the ‘A’ phase of the 330 kV hybrid switching unit¹ associated with 330 kV CB 6012 at Braemar substation. As per design, only ‘A’ phase of CB 99012 at Bulli Creek tripped.

All protection operated correctly and as designed.

At 20:04:10 hrs, the auto-reclose function operated on Bulli Creek CB 99012 to re-energise the ‘A’ phase of the 9901 Braemar – Bulli Creek 330kV transmission line at Bulli Creek.

(Note: To avoid a protection blind spot, the 9901 Braemar – Bulli Creek 330 kV transmission line and the No.1 330/275 kV transformer at Braemar have overlapping protection zones. Therefore, the transformer protection system tripped all phases at the Braemar end of the 9901 Braemar – Bulli Creek 330 kV transmission line to clear the high voltage fault)

The status of the power system immediately after the incident is shown in Figure 2.

¹ Hybrid switching unit – multiple switching devices integrated into one unit per phase. The 330 kV hybrid switching units contain a circuit breaker, isolator and earth switch

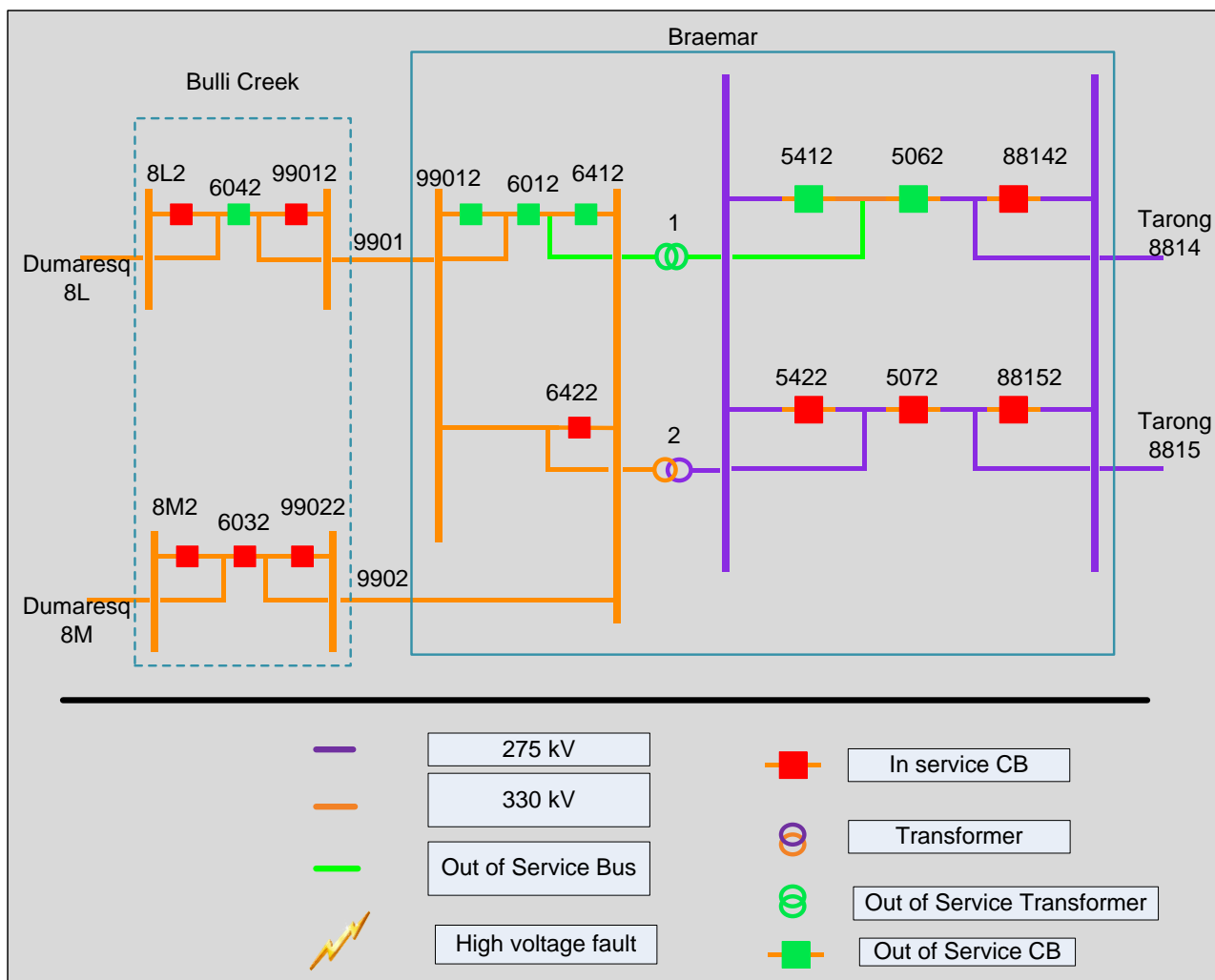


Figure 2 - Status of the power system after incident.

4 Immediate Actions Taken

AEMO issued Electricity Market Notice No.40047 at 2014hrs on 18 October 2012 to advise the market of this non-credible contingency event. The Q-BCKBR_9901_9902 and Q-BR_TX constraint sets were invoked at DI 2015 to reflect the outages.

At 2019 hrs on 18 October 2012, the 9901 Braemar – Bulli Creek 330 kV transmission line was returned to service. The Q-BCKBR_9901_9902 constraint set was revoked at DI 2020.

At 1507 hrs on 19 October 2012, the Braemar No.1 330/275 kV transformer was returned to service. After Powerlink had advised AEMO that the restoration work had been completed at 1524 hrs, the Q-BR_TX constraint set was revoked at DI 1525.

AEMO issued Electricity Market Notice No.40058 at 1619 hrs on 19 October 2012 advising that the 9901 Braemar – Bulli Creek 330 kV transmission line and the No.1 330/275 kV transformer at Braemar had been returned to service and that the event would not be reclassified as a credible contingency as the failed 330 kV hybrid switching unit associated with 330 kV CB 6012 at Braemar had been isolated.

5 Follow-up Actions

Powerlink inspected 330 kV CB 6012 at Braemar on 19 October 2012 and found evidence that a high voltage fault had occurred on the 330 kV hybrid switching unit associated with this CB. The

failed hybrid switching unit was isolated from the power system prior to restoration of the No.1 330/275 kV transformer at Braemar at 1507hrs on 19 October 2012.

On 23 October 2012, the 330 kV CB 6012 at Braemar was returned to service after the 330 kV hybrid switching unit was replaced.

Powerlink has initiated an investigation to establish the cause of the high voltage fault. The investigation is expected to be completed by 28 February 2013.

6 Power System Security Assessment

The power system voltages and frequencies remained within the normal operating bands and the power system remained in a secure operating state throughout the incident. There was no loss of supply as a result of this event.

7 Conclusions

The multi-element trip at Braemar substation was caused by a high voltage fault on a hybrid switching unit associated with 330 kV CB 6012. Protection systems operated correctly to clear the fault by tripping circuit breakers that removed the 9901 Braemar – Bulli Creek 330 kV transmission line and the No.1 330/275 kV transformer at Braemar from service.

Powerlink intends to carry out an investigation into this incident and will advise AEMO accordingly of any actions. AEMO is satisfied that the actions Powerlink has proposed will mitigate the risk of a similar incident occurring in the future.

AEMO correctly applied the criteria published in section 12 of its Power System Security Guidelines in assessing that the circumstances of this incident did not warrant reclassifying similar incidents as a credible contingency event.

8 Recommendations

Powerlink will inform AEMO of any actions following its investigation by 28 February 2013.